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Tackling the wicked problem of ERM: using the Cynefin framework as a lens

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Abstract

Purpose of this paper: What are the reason(s) for writing the paper or the aims of the research?
This article complements a previous article on using the Cynefin framework to make sense of the electronic records management challenge. Its focus is on how to use Cynefin, and the ERM framework developed using it, as an approach to addressing this wicked problem. The aim is to provide examples of how they could be used in practice in different organisational contexts.

Design/methodology/approach: How are the objectives achieved? Include the main method(s) used for the research. What is the approach to the topic and what is the theoretical or subject scope of the paper?
Four examples are provided. Empirical research data are used to underpin three of the examples and a thought experiment using published literature informs the fourth one.

Findings: What was found in the course of the work? This will refer to analysis, discussion, or results.
The examples illustrate the potential value and power of the Cynefin framework as both a practical and conceptual tool in the ERM context. It can be used to address the ERM challenge in different ways: as a strategic approach taking a holistic view and/or as a tactical approach at a more specific granular level. It can be used to inform practice by helping practitioners choose the most appropriate approach dependent on the level of complexity of the issue they are addressing, whether that is for a specific issue, a project or initiative, for planning or for exploratory, sense-making purposes.

Research limitations/implications (if applicable): If research is reported on in the paper this section must be completed and should include suggestions for future research and any identified limitations in the research process.
The examples draw upon one qualitative, empirical set of research data and one published use. Further experimentation and practical use are required; others are encouraged to use Cynefin to test the propositions and provide further examples.

Practical implications (if applicable): What outcomes and implications for practice, applications and consequences are identified? Not all papers will have practical implications but most will. What changes to practice should be made as a result of this research/paper?
The examples provided can be adopted and/or adapted by records professionals, both practitioners and/or academics, at strategic and tactical levels in different records contexts.

Social implications (if applicable): What will be the impact on society of this research? How will it influence public attitudes? How will it influence (corporate) social responsibility or environmental issues? How could it inform public or industry policy? How might it affect quality of life? Not all papers will have social implications.
None

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What is original/value of paper: What is new in the paper? State the value of the paper and to whom.

This paper provides examples of adopting a different approach to tackling the wicked problem of managing electronic records using the Cynefin framework as a new lens.

Keywords: Electronic records management, Strategic approach, Cynefin framework
Article Type: Research paper

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Tackling the wicked problem of ERM: using the Cynefin framework as a lens

Introduction

In a previous article (McLeod and Childs, 2013a) we argued that the management of electronic records displays all the characteristics of a 'wicked' problem as articulated by Rittel and Webber (1973). Wicked problems contrast with tame ones (Rittel and Webber, 1973; Conklin, 2006, pp.14-18). The latter are well-defined, belong to groups of similar problems that can be solved in similar ways, have solutions that can be tried and abandoned with little consequence, and have a limited number of alternative solutions. Electronic records management (ERM) does not fit this description:

> "the ERM challenge is complex, contextualised and contingent"
> McLeod and Childs (2013a, p.7).

This was the conclusion of the AC^{+}erm research project (www.northumbria.ac.uk/acerm) which investigated ways of accelerating change in ERM by identifying the issues and potential solutions, both to try or to avoid, based on empirical evidence gathered from the literature and multi-disciplinary stakeholders worldwide. Many of the project's headline findings relate to people issues rather than to process or technology issues (McLeod, Childs and Hardiman, 2011, pp.73-74). These include "human resources and human capacity, roles and responsibilities, vision, leadership, culture, awareness, drivers and barriers, attitudes and user needs" (McLeod and Childs, 2013a, p.1). "People issues are challenging because they concern culture, worldviews, and preferences and behaviour related to the use of RM/ERM systems" (McLeod and Childs, 2013b). The project data about these issues are rich and nuanced and required further analysis to gain a deeper understanding. The Cynefin framework (Snowden, 2010) was used to make sense of the issues and potential solutions. The outcome was a re-conceptualisation of the ERM challenge and the creation of a strategic framework for tackling it (McLeod and Childs, 2013a).

In this article, which complements the previous one (McLeod and Childs, 2013a), we focus on how to use Cynefin and the ERM framework we developed by using it, as an approach to addressing this wicked problem. The aim is to provide examples of how Cynefin and the ERM framework could be used in practice by information and records professionals in different organisational contexts. This is needed because some of the AC^{+}erm project headline findings highlight the contextualisation and complexity of the tactics and solutions for ERM, and the contingency of their success and/or failure. An approach such as Cynefin can, therefore, help practitioners choose which solutions to try in a particular circumstance.

Cynefin and its use for problem solving, decision-making and action taking

The Cynefin framework is a 'sense-making' framework developed by Snowden and colleagues (Snowden, 2010). It helps decision makers to make sense of problems and situations, in different dynamic business contexts, and take appropriate action (Kurtz and Snowden, 2003). The conceptual underpinning of the framework has its roots in knowledge management (e.g. Boisot and Cox, 1999; Nonaka and Takeuchi, 1995; Senge, 2006) and complexity science (Burnes, 2005; Stacey, 2011). Because of this Cynefin resonates with the problem the AC^{+}erm project set out to explore and appeared to offer an appropriate approach for making sense of the project data, and linking the issues to solutions to support appropriate action for change.

Cynefin comprises five domains (Figure 1) predicated on the construct of order (Snowden, 2005, 2010). They represent the types of situations or environments that organisations typically experience and need to respond to and manage (Lambe, 2007, p.134). The ordered domains are labelled *simple* and *complicated,* the un-ordered ones *complex* and *chaos* and

the fifth domain, the central area, is the domain of *disorder*. Un-order is not lack of order but order that is 'emergent' (Kurtz and Snowden, 2003). Each domain can be described according to its characteristics, decision model and resultant action(s), management style, work pattern and organisational connections/networks. These are summarised in Table I and briefly explained below, based on the publications of Snowden and his colleagues (Kurtz and Snowden, 2003; Snowden, 2001, 2002, 2003, 2005, 2010; Snowden and Boone, 2007). A more detailed explanation is provided in the previous article (McLeod and Childs, 2013a).

Insert Fig. 1. Cynefin framework from Snowden (2010, Part 7)

Insert Table* I. *Summary explanation of the four Cynefin domains: simple, complicated, complex, chaos

The *simple* domain is characterised by cause and effect. The decision model is to sense the situation, *categorise* it and respond based on best practice. The domain of efficiency and best practice, there is often a right answer. The *complicated* domain is also characterised by cause and effect but there may be multiple right answers. The decision model is to sense, *analyse* and respond, which requires expertise to choose the appropriate answer i.e. good rather than best practice. The *complex* domain is characterised by unpredictability and flux; cause and effect can only be understood in retrospect. Experimentation is required to find answers. The decision model is to *probe* first then sense and respond; practice emerges. Turbulence and lack of any link between cause and effect characterise the domain of *chaos*. In the absence of any right answers the decision model must be to *act* first and then sense and respond as, for example, in crisis management. The (central) domain of *disorder* is where people are unable to decide which of the other domains represents their situation. No domain is more desirable than the other; they just describe the situation facing the organisation (Kurtz and Snowden, 2003).

Important elements of the Cynefin framework are the boundaries between domains, which are derived in the process of using the framework in a given context, and dynamics which are related to movements across boundaries. Kurtz and Snowden (2003, p.474-80) discuss both in great detail. The tetrahedrons (Figure 1) are also a vital part of Cynefin, representing the connections between the centre (e.g. managers) and the constituents (e.g. staff), and reflecting management style and work patterns.

Cynefin can be used in different organisational contexts and for different purposes e.g. to gain new insights on a challenging problem and to consider strategies for managing different situations (Kurtz and Snowden, 2003, p.471). Our use of Cynefin (McLeod and Childs, 2013a, 2013b) appears to be the only published example in a records management context other than Lomas' co-operative action research PhD project (Brown, Demb and Lomas, 2009; Ellis, Lomas and Ridge, 2009).

Using Cynefin in an ERM context

Four different examples are provided which explore the use of the Cynefin framework for tackling the wicked problem of ERM. Empirical research data from the AC^{+}erm project, and the ERM framework developed using the Cynefin framework to make sense of the data, are used to underpin the first three examples. Published literature informs the fourth example. The examples explore aspects of ERM through the lens of Cynefin and illustrate how appropriate approaches to aspects of ERM in organisations can be developed. Each one focuses on the new view and insights gained from using the Cynefin framework, showing how the AC^{+}erm research findings can be exploited because of their presentation in the domains and how Cynefin itself could be used in an ERM context.

Example 1 is more straightforward, exploring ways of selecting appropriate solutions for an ERM issue based on a better understanding of the nature of the issues from their Cynefin domain location. Example 2 is more intricate because it highlights how an ERM issue can be located in more than one domain depending on the stakeholder's perspective. Example 3 looks how Cynefin can be used to manage chaotic issues and particularly discusses the concept of dynamics which provides a way of making sense of change within an organisation, and of thinking about how to address issues. All three examples draw on the AC^{+}erm data related to people issues, comprising issues and proposed solutions.

Three electronic Delphi studies (Linstone and Turoff, 2002; McLeod and Childs, 2007) were conducted in the AC^{+}erm project to gather expert opinion, covering the facets of people issues, understanding work processes, and systems and technologies in sequence. For each Delphi study, the early rounds of questions focussed on the relevant ERM issues, initially exploring and expanding on the issues identified from a systematic literature review, then ranking them in priority order. The later rounds focussed on discussing the possible solutions - to try or avoid - that could be used to address the issues. Fifty five people across the world, from different disciplines and organisations representing all four stakeholder groups involved in ERM (ISO, 2001, 2011), participated in them (see McLeod and Childs, 2013a; McLeod, Childs and Hardiman, 2010a). The AC+erm data relating to people issues comprised 446 individual themes. The 25 meta themes that emerged from grouping these themes using Cynefin form the populated Cynefin framework of ERM people issues, referred to here as the ERM framework (Appendix Table AI). The solutions discussed in this article are given in Tables II-VII. They are only a sample of the solutions collected in the AC^{+}erm project. The individual solution themes relevant to people issues comprise 871 themes from the AC^{+}erm Delphi study that covered the people facet and 289 themes addressing people issues from the Delphi studies covering the process and technology facets. The solutions were proposed by the Delphi participants in response to specific questions about issues. However analysis showed that there were only a few categories of solutions. These solution categories comprised: organisational structures; roles and responsibilities; benefits of RM/ERM and the disadvantages of poor RM/ERM; marketing of RM/ERM; skills; training; general RM approach; records professionals' approach; selection and design of systems approaches; systems implementation approaches; change and change management. These categories were in turn broken down into sub-categories. Each sub-category contains a number of individual solutions. The solutions for every issue are drawn from some or all of these categories/sub-categories. It was difficult to identify any solution that was specifically related to only one issue. This led to the conclusion that linking issues to solutions highlights a many-to-many not a 1-to-1 relationship between them, i.e. for each issue there are many solutions and each solution can resolve many issues (McLeod and Childs, 2013a). Such a conclusion supports the usefulness of Cynefin in enabling the identification of appropriate solutions to use.

Example 4 is slightly different and draws not on the AC^{+}erm data but on a published use of Cynefin to plan and manage a project(s) (Van Beurden et al, 2011). It explores the potential use of the Cynefin framework to address a grand challenge that has many RM/ERM elements and is equally as wicked a problem. It considers how aspects of the problem reside in different domains and can be addressed in a planned way, as a project using Cynefin.

Example 1: Selecting the right solution for the issue (tactical)

This example explores how the nature of the domain in which an issue is located enables the selection of the appropriate solutions to address that issue. It draws on the AC^{+}erm data related to issues that was developed into an ERM framework using Cynefin (Appendix Table AI) and the proposed solutions (Tables II-VII). One of the headline findings from AC^{+}erm was that "records professionals may be part of the problem as well as part of the solution" (McLeod, Childs and Hardiman, 2011, p.74). "On the positive side, records professionals

take a holistic view and have the principles and tools to manage records; however their demands may be unrealistic or too constraining" (McLeod, Childs and Hardiman, 2011, pp.80-81). What are the issues in the ERM framework that relate to records managers?

There are three domains in which issues related to records managers can be found (Appendix Table AI):

- simple domain - meta theme 'training', focusing on the aspects related to training RM experts
- complicated domain - meta theme 'the experts', i.e. the professions involved in ERM, their role and the nature of their discipline, focusing specifically on RM experts
- complex domain - meta theme 'attitudes/perceptions of experts', focusing on the RM experts

In the simple domain the issue of training records managers includes the need for training to cover the knowledge and skills needed for ERM. This comprises: RM theory and methods (particularly their applicability in changing environments); advanced IT (including new technologies); general business management; risk management; analysis, e.g. business process analysis; sector expertise; project management; change management; people management; training others (Table II; McLeod, Childs and Hardiman, 2010b). The Delphi participants provided a range of solutions for training records managers, covering the type, level, mix and content of training (Table III.). Training (and education) needs to be provided as professionally recognised qualifications, tertiary professional qualifications and continuing professional development (CPD). Organisations need to recruit professionally qualified records managers who are passionate about their profession and have relationship management skills. It was noted that 'Masters degree programmes for records professionals do not provide the required ECM [enterprise content management] project skills and thorough understanding of the IT world'. This requires changes to curricula, driven both by educators and the professional bodies who accredit such courses. An appropriate mix and level of the above knowledge and skills are required, e.g. basic project management skills are often sufficient; but a records manager would only need advanced skills (e.g. the PRINCE2 UK government project management methodology) if they were involved in a large scale project. In this instance these specific skills could be obtained via CPD. Organisations need to invest in CPD for records managers. Collaborative training for RM, IT and other professionals for mutual learning and understanding of each others' roles and constraints would also be an effective approach. Another solution is to provide advice and support for records managers (Table IV); a great deal already exists in the form of toolkits and published EDRMS (electronic document and records management systems) evaluations. Delphi participants provided many tips on how records managers could more effectively train staff about RM; e.g. instilling the RM culture, policy and processes at the start of employment during induction, tailoring sessions to specific groups of staff, linking training to personal experiences, using real examples, pictures, and active communication.

Insert Tables II A sample of the solutions related to skills, III A sample of the solutions related to training & IV A sample of the solutions related to the general RM approach but please position to avoid breaking up the paragraphs of text too much.

The most challenging part of the knowledge and skills required by records managers relates to RM. Records managers need to realise that existing RM theory and methods may not be fully applicable in the e-environment and require adaptation (Table IV). However, there is no agreement between participants, or and in the wider literature, on what these adaptations comprise (see for example the range of debates: Bailey, 2008; Oliver et al, 2009 and 2010; McLeod, Childs and Hardiman, 2010c; McLeod, 2012; Upward et al, 2013). Delphi participants gave suggestions for some concepts that were not applicable (life cycle model, original order, breaking down file collections/series into volumes, manual signatures), some concepts that need adaptation (appraisal - prior to creation not post hoc) and some concepts

that are applicable (continuum model, authentication, requirements audit). There is a need to test the value of RM principles and methods in practice.

Many of these solutions are obvious, but the simple domain is the domain of best practice and for issues in that domain such practice should be sought to address the issue.

In the complicated domain issues about the experts – records professionals are:

- *the changing role of records professionals - implications*
  The e-environment is changing the traditional role of the records manager. Some of the implications of this are illustrated by themes such as: 'RIM professionals' RM role threatened by other professions as ERM emerges'; 'If records professionals are seen to only cover records not information, then the wider value of their expertise is not recognised'; 'Records management staff are now entirely engaged in information consulting roles rather than managing records systems, [the latter of] which are mostly run by third parties'; 'Records professionals focus on quality RM because forensic capability removes the need to focus on risk'.
- *the changing role of records professionals – opportunities*
  These changes provide opportunities as these themes illustrate: 'New role for RIM professionals to play in e-environment', 'Records professionals' knowledge can enhance other professionals roles and outputs'.
- *the changing role of records professionals - barriers*
  There are, however, barriers to achieving these opportunities, illustrated by themes such as: 'RIM / RM / archival professions struggling with ERM'; 'recordkeeping approach of records professionals is bottom-up, without an understanding of the top-down view'; 'records professionals often lack the skills to manage their changing roles'; 'records professionals have insufficient voice to enable delivery of the full potential benefit of their contribution to organisational IM strategy'.
- *disjunction between different records professional groups*
  Perspectives differ between different parts of the RM profession, illustrated by these themes: 'split between archivists and record managers detrimental in face of challenges of ERM'; 'gap between the researchers, theorists and the practitioners'; 'disjunction between RM theorist and RM practitioner understanding of ERM aspects'.

What solutions can address these issues? Ones suggested include training, partnership working, proactivity, and the appropriate location of the RM corporate function (Tables III, V, VI). The types of education and training solutions discussed earlier can help records managers to obtain the skills necessary for new and future roles. Partnership working can address the challenges of other professionals entering the ERM sphere (McLeod, Childs and Hardiman, 2010d). For example, building a multidisciplinary team in an organisation to tackle ERM provides the opportunity to learn about each others' profession, develop a shared understanding of concepts, perspectives, requirements and potential solutions, as well as providing the organisation with the required skills mix. Networking with other RM professionals helps to tackle disjunction within the archives and RM discipline, as well as providing insights into how others have dealt with ERM. Research, by and between academics and practitioners, also provides knowledge for tackling the ERM challenge. A holistic and proactive approach is needed for ERM, not narrow or with a purist RM focus. Records managers need to undertake advocacy within their organisations, experiment with and use the new technologies and become involved in business projects. Organisations need to consider the most appropriate location of the RM corporate function and its interrelationship with other corporate functions and to redeploy records managers into the new roles required by ERM. Delphi respondents gave a range of opinions on where the RM function should be located, e.g. a unified IM function (incorporating RM, IT and legal), RM situated within the legal function, or risk management or quality management, RM aligned

with but not part of the IT function, outsourcing of the RM function. There is no one 'best' location, only 'good' or better ones (compare good vs best practice).

Insert Tables V A sample of the solutions related to records professionals' approach and VI A sample of the solutions related to organisational structures but please position to avoid breaking up the paragraphs of text too much.

Many of these solutions are illustrative of the time the data was collected (i.e. 2008-09). Some are now very well known, but there are also new ones. The important point is that knowing what the issue really is and its nature, from its domain location, enables the identification of solutions that are more likely to be applicable and those which are most appropriate. For issues in the complicated domain the good practice solutions available must be evaluated and the appropriate one(s) selected for the particular context.

In the complex domain the characteristics of the records management discipline are intensified into attitudes and perceptions, illustrated by these themes:

- 'records professionals have an introspective focus on their own methods'
- 'some records professionals' approach to RM was too inflexible',
- 'RM practices lag behind technology because of the conservatism of RM professionals'
- 'automatic RM processes in IT systems are difficult to achieve in practice because of the suspicions of records professionals'
- 'records professionals' professional jealousy limits scope of training offered to staff'
- 'records professionals must avoid a passive approach or victim mentality'
- 'RIM professions see many challenges to ERM'
- 'records professionals lack recognition of end user perspectives'.

Solutions offered by the Delphi participants described the personal attitudes and RM approaches that records managers should adopt (Table V). Records managers need to be proactive and holistic, avoiding a narrow RM focus and introspection and a victim mentality. Adapting RM principles and methods as discussed above will be necessary, and even more radical approaches may need to be adopted (Bailey, 2008; McLeod, Childs and Hardiman, 2010c; McLeod, 2012; Upward et al, 2013). Such radical approaches include: using RM for important records only; recognising that only a subset of staff need to know about RM procedures or to receive RM training, and that this knowledge does not have to be detailed or complete; avoiding marketing RM as an arcane function or as exciting or likeable; using a big buckets plus search approach (as described in Cisco, 2008 and Galloway, 2008). However, the Delphi participants did not offer much detail of ways to change records managers' attitudes and perceptions and therefore alter their behaviour. The solutions they did offer include: providing advice, support and encouragement to records managers; undertaking and publishing their own research (e.g. case studies of RM/ERM in their own organisations); networking with other records managers (e.g. joining professional organisations, attending conferences, working/discussing with experienced colleagues).

The complex domain covers the challenging people issues such as attitudes, perceptions and behaviour. These are hard to change, even when an individual is motivated to change, and what works for one person may not work for another. In the complex domain the success of a solution is not guaranteed. It is a matter of trying a solution, seeing if it works, and if not trying another one. The solutions identified above address what individual records managers should try. A gap in the data is the need for the RM profession, and professionals within it, to champion for the required change and to facilitate/mentor individual records managers to change.

The AC^{+}erm data comprises solutions to avoid as well as ones to try. Solutions to avoid could be ones that failed because of the contingency of success, or because they were inappropriate to the domain nature of the issue they were used to address. An example from the data demonstrates how a solution could fail because it is inappropriate for the domain. One solution to avoid was records managers adopting a purist RM focus (Table V). A records manager's perspective of RM procedures (e.g. classification, declaration and retention) lie in the simple and complicated domains. Staff need awareness raising and training about such procedures (simple domain); EDRMS, for example, are designed to implement these procedures with a greater or lesser degree of staff input (complicated domain). However, staff perceptions (complex domain) are that RM procedures are a burdensome overhead and that EDRMS implementations have excessive requirements. One Delphi participant noted that making records procedures visibly purist or onerous is likely to lead to the response from staff that 'I am not a records clerk'. Gunnlaugsdottir's (2009) research suggests that an organisation cannot always rely on compliant, 'conscientious' employees to capture records into an ERMS. Therefore, designing EDRMS that requires staff to carry out such RM procedures would not necessarily be effective or acceptable and could lead to their lack of compliance with the system. Discussions in the literature on problems with EDRMS and how they could be better designed include Goldschmidt, Joseph and Debowski (2012), Gunnlaugsdottir (2009), Maguire (2005), Jones (2008); Singh, Klobas and Anderson (2007) and Wojcik, Gouin and Dionne (2003). Raising staff awareness of RM procedures by providing them with training is only a partial solution to improving the level of compliance; solutions appropriate to the complex domain are also required. One such example provided is to create usable file-plans, that are user-agreed and not imposed (consultation and communication are appropriate approaches for the complex domain).

Example 2: A strategic approach to systems selection

This example explores how one issue could reside in both the complicated and the complex domains, and even on the border of chaos, depending on the perspective taken. It relates to the idea of wicked problems (Rittel and Webber, 1973) discussed in the fourth example, where deciding on a solution results in the definition of the problem. It draws on the AC^{+}erm data related to issues, developed into an ERM framework (Appendix Table AI) using Cynefin, and the proposed solutions (Tables II-VII).

Design of systems is an issue within the complicated domain, and it would be expected that selection of such systems would also lie in that domain. However, aspects of system selection fall within both the complicated and complex domains, and also lie on the border between the complex and chaos domains. Selection of systems and system approaches to be adopted by an organisation is usually carried out by senior managers.

The Delphi data demonstrates that system selection decisions have much to do with managers' attitudes and perceptions (the complex domain). In all organisations selection of systems is very political (with a small p). In public sector organisations it is also political (with a big P) because of the involvement of government ministers and the implementation of government policy. Much of the Delphi data (Table VII) covers the types of systems to avoid, and reflects the bad experiences that participants had had. The types of system approaches that should be avoided comprise centralisation, whole organisation solutions, all embracing systems, generic systems, large systems, systems that 'promise everything', 'shiny' superficially attractive solutions, single-source solutions, expensive systems, systems from major providers, quick-fix solutions, technology driven solutions, systems with a purist RM focus, and systems that isolate RM into a silo. Various reasons were given why such systems should be avoided, e.g. centralised systems have excessive scope ('over-stretched', 'over-reach'), excessive expense, lack reliability, lack flexibility ('bureaucratic'), are centrally driven and lack independence (vulnerable to political intervention); all embracing systems have excessive expense, lack effectiveness, lack full integration, are

prone to rapid obsolescence; generic systems lack specific RM functionality and lead users to devise 'creative ways' to avoid using them.

Insert Table VII A sample of the solutions related to the selection and design of systems approaches but please position to avoid breaking up the paragraphs of text too much.

The Delphi participants thought that simple system solutions are needed, that are affordable, reliable and scalable, and that before the selection/design of the system, requirements analysis needs to be carried out. Requirements analysis, though including input from users, resides in the complicated domain and involves experts such as IT staff, records managers and business professionals. Requirements analysis is good practice in software design and comprises obtaining information about business drivers, business model, functional and system requirements, business and system use cases, technical requirements, system qualities (i.e. non-functional requirements), constraints and assumptions. Requirements analysis is routinely carried out, but Delphi participants felt that not all the IM/RM requirements are captured, e.g. for enterprise-wide systems the IM/RM aspects may not be fully considered, and records managers and recordkeepers may not be involved in the process. Lack of capture of all the IM/RM requirements results in systems that are partial and even counterproductive: "software engineering projects are critically vulnerable when these activities are performed poorly" (IEEE Computer Society, 2004). Delphi participants suggested that records managers and individual staff members need to collaborate to identify IM/RM requirements within the corporate perspective. Methods to capture such requirements include: consultation with staff by one-to-one interviews and ongoing; shadowing and observing staff; investigating working practices and processes. The staff members charged with these tasks would need multiple skills, e.g. project management, subject expertise, ability to build trust with others. Although not explicitly mentioned by the Delphi participants in this context, knowledge and use of RM specific tools would also be required e.g. MoReq2010 (DLM Forum Foundation, 2010) and DoD 5015.2-STD (US Department of Defense, 2007).

Requirements analysis is part of systems analysis. Systems analysis takes a wider organisational perspective and comprises a structured approach to understand the current way the organisation works, find out the desired goal and the best methods to achieve that. Tools such as DIRKS (Design & Implementation of Recordkeeping Systems) (State Records New South Wales, 2007) contextualise this for records management. The Delphi participants were asked why systems analysis was so rarely undertaken before system design, procurement or implementation. The reasons given for lack of use of systems analysis comprised a mix of simple and complex issues. Simple issues were: it takes time - people are too busy, always fire-fighting; its expensive and budgeting cycles do not allow for money to be carried forward for longer tem activities; lack of understanding; lack of experience; lack of skills – capable in-house staff are needed to carry out the systems analysis as this expertise cannot be bought off-the-shelf. Complex issues were: it is a waste of time; belief in the need for speed; a focus on present benefits over future benefits; choice of quick fixes; belief that off-the-shelf products are safe; belief that it is unnecessary as requirements are already known; belief that staff at all levels know about corporate functions and organisational activities; belief that there is no need for change.

The issue of systems selection also verges into chaos. The meta theme on the border between the complex and chaos domains covers 'the different characteristics of the types of information, processes and technology' that are encountered in organisations. ERM is needed for both structured and unstructured information/processes, and controlled and uncontrolled technologies. As well as line-of-business systems there are office and mobile systems, applications such as email, social networking tools and the cloud. The Delphi participants ranked the issue of 'the appropriate approach to ERM within a given context' as

the most urgent technological issue to be addressed. The possible approaches considered by the participants comprised: a dedicated EDRMS; using existing functionality in line-of-business / office / mobile systems; embedding RM functionality in line-of-business / office / mobile systems; integrating EDRMS with other corporate IT systems; or some combination of these. They felt that no one approach was 'the answer' in isolation or in all contexts. The most important determinant of the mix of approaches to be used in an organisation are the people factors: it is the end result that matters (i.e. good ERM) not the technology used to get there.

The AC^{+}erm project was undertaken towards the end of the period of wide spread deployment of EDRMS, driven by, for example, government policy, legislation and regulation (e.g. in the UK *Modernising Government*, 1999; *Freedom of Information Act,* 2000). Informal discussion among RM professionals and academics was starting to suggest that EDRMS were not the answer, although little of these problems has been published (Maguire, 2005; Wojcik, Gouin and Dionne, 2003). There was qualified agreement from Delphi participants to the statement that 'a dedicated EDRMS is the best approach'. We are now in the era of enterprise systems. Some of the AC^{+}erm data on EDRMS may be applicable to selection and design of enterprise systems. The Delphi participants noted the need for EDRMS to be seamlessly integrated with other IT systems and for additional RM functionality in line-of-business systems. Not all EDRMS had good integration with other IT systems – in practice most were stand-alone. Requirements for integration involved factors such as the cultural mindset, inclusion of EDRMS in the information management and technology strategy, incorporation of all business processes, and prevention of staff workarounds. A number of factors were noted that made for a successful EDRMS, e.g. using EDRMS only as final repository for records (from office and business systems) not for daily RM, tight integration with office and business systems, and usability. Ways to achieve usability included a user-friendly interface (e.g. the familiar, corporate desktop) and user friendly file plans (e.g. user-agreed, simple, easy to edit and update). Factors that resulted in failure of EDRMS included lack of use of middleware, lack of recognition of the degree of customisation needed with commercial, off-the-shelf products, the requirement for users to declare records, and increasing the time users had to spend on simple tasks.

Example 3: Managing chaotic issues

This example explores how to manage an issue within the domain of chaos. It also draws on the AC^{+}erm data related to issues and proposed solutions (Appendix Table AI and Tables II-VII). It illustrates how the use of Cynefin dynamics helps with sense-making about issues and identifying the appropriate solutions to use.

A number of articles (Kurtz and Snowden, 2003; Snowden 2005, 2010) discuss Cynefin dynamics (Figure 2), which are ways of making sense of change within an organisation, both past changes that have created the current situation and ways of enabling future change. "When people use the Cynefin framework, the way they think about moving between domains is as important as the way they think about the domain they are in, because a move across boundaries requires a shift to a different model of understanding and interpretation as well as a different leadership style. Understanding the differences among the different movements in the framework increases the sophistication of the response of a decision-making group to rapid change". (Kurtz and Snowden, 2003, p.475)

Insert Fig. 2. Examples of Cynefin dynamics from Snowden (2010, Part 6)

Dynamics are intricately related to the boundaries between domains, as they are movements across boundaries or involve the breaking down of boundaries. Metaphors are used to make sense of the boundaries. A metaphor of a boundary in everyday use is the glass ceiling, the unseen but unbreakable barrier that prevents able women from reaching the higher

management levels in an organisation. Metaphors for Cynefin boundaries include shallow rivers which can be crossed by anyone anywhere, deep chasms which need bridges which can be built or demolished as required or as determined by others, and high plateaus where people are not aware of the drop until they fall off (Kurtz and Snowden, 2003; Snowden, 2010). Boundaries can also be compared with physical concepts; e.g. being permeable (i.e. a barrier that can be passed through), semi-permeable (a barrier that only certain things can pass through) and porous (i.e. a barrier having holes/pores through which things can pass). Boundary metaphors are context specific. The nature of boundaries between domains depends on the conditions present in the organisation using a populated Cynefin framework. The idea of boundaries is not to restrict issues and solutions to one domain but to demonstrate that an organisation exists within many domains, and needs to flexibly adopt the approaches applicable to the different domains. Additionally, boundary ideas help to explore ways of moving between domains to create benefits, advantages and improvements. The tetrahedrons, that represent how connections and networks between managers and staff alter in different dynamic situations, provide a further way of making sense of such changes.

Snowden (2005) illustrates Cynefin dynamics using the cases of crisis management and of innovation.

For the case of crisis management, Snowden (2005, p.51) notes that crises often occur where there has been an unrecognised context change in the simple domain and "best-practice approaches have led to a set of conditions where weak signals of a context change are not seen". The system collapses catastrophically into chaos. There are two different approaches to dealing with the resultant chaos. One approach is decisive, directive management control to re-establish the good practices, forcing a move from chaos back to the simple domain. These dynamics are 'collapse' and 'imposition' (Kurtz and Snowden, 2003, p.476). The other approach is to look for small patterns in the chaos that show the type of practice the organisation wants to have, or to set up such patterns i.e. 'swarming' (Kurtz and Snowden, 2003, p.476). Managers can support these beneficial patterns and try to replicate them throughout the organisation, moving from chaos to the complex and then the complicated domains. Neither of these approaches guarantees success. Metaphors of the structure of boundaries help to make sense of the approach that might be more successful in a given context. The high plateau or ravine which is unseen until a person falls into it and is very difficult to get out of or climb back up due to its sheer walls, provides a good metaphor for the boundary between the simple and chaos domains and the catastrophic breakdown above. It demonstrates that trying to force a move back to the simple domain (imposition) is difficult and likely to be unsuccessful.

For the case of innovation, Snowden (2005) discuses two barriers to innovation – entrenched thinking of experts and over-confident, over-rigid bureaucracy. To enable innovation involves overcoming these barriers. An approach to try and break down the entrenched thinking of experts is to place them into trans-disciplinary settings, getting them thinking in different ways and adopting new ideas and methods. This could be viewed as moving experts from their complicated domain into chaos, then to the complex domain so they can develop new patterns and then back to the complicated domain to create new good practices (i.e. entrainment breaking). For bureaucrats, an approach is to present them with problems where the solutions are hidden and multiple (the complicated domain), via the complex domain with a view of chaos to show them that things could be far worse (i.e. liberation). A different approach to encourage innovation is set up innovation teams which work in the complex domain trying out new ideas (i.e. exploration/just-in-time transfer), and also work with crisis management teams to look for possibilities of creative responses to chaotic situations (i.e. divergence/convergence). Brown and Eisenhardt (1998) describe an approach to strategy making for organisations facing rapid and unpredictable change, 'competing on the edge', that involves working in the complex domain.

The ERM example in the chaos domain is illustrated by the meta theme 'the breakdown of records management / recordkeeping'. A number of technological changes have contributed to this. The advent of the PC onto people's desks in the 1980s brought individualisation to the conduct of business processes. These tools facilitated productivity so were welcomed, and recordkeeping was devolved to the individual member of staff. However PCs provided little if any functionality for records management, and established records management procedures were usually not applied in this context. This resulted in a culture of casual creation of records and lack of RM discipline. The ubiquitous communication application email, is an example of an old technology (though dating from the 1960s, its rise in general use mirrors that of the PC) that is still poorly managed in some organisations. None of the methods to manage email, such as journaling, 'archiving' and vaulting systems or EDRMS, provide the full answer (see for example Harris, 2013), causing new approaches to be developed (see for example Ravanbakahsh, 2013). The rise of the World Wide Web in the 1990s created an assumption that all information is available on the Web and can be easily obtained through searching. Linked societal changes of increased informality and reduced hierarchies and the focus on the individual, also contributed to changes in the way people work. New technologies such as social networking tools have contributed further to the chaos. The greatest control of records is often found in highly regulated sectors (e.g. pharmaceutical companies, nuclear industry) and in organisational line-of-business systems dealing with key functions such as finance.

However, Delphi respondents did not feel that poor RM created by this chaos was a crisis situation since organisations can survive, even be successful, with poor RM. Various reasons were given for this. RM is not seen as essential and RM departments and records managers can occupy relatively low positions in the organisational hierarchy. RM is not seen as a basic infrastructure, it lacks legitimacy in comparison with other corporate functions such as estates or IT, the benefits and costs of RM are indirect, its nature is abstract and intangible, it lacks visibility and there is a perception that it is of low value. Therefore, it is unlikely that organisations would adopt decisive, directive management control to force a return to disciplined RM (i.e. imposition). This leaves the option for the organisation and/or the records manager of using 'swarming'. Some of the solutions offered by the Delphi participants could have potential as swarming points. They fall into the categories of (i) changing attitudes and behaviour, (ii) changing RM approaches, and (iii) technology.

Solutions that attempt to change staff attitudes and therefore behaviour include marketing individual benefits and managing expectations of ERM systems. These are suitable 'probes' to attempt to achieve the emergence of recognition of the value of RM/ERM and better recordkeeping behaviours respectively. These are solutions tackling complex issues.

Other solutions involve accepting that strict RM procedures are unlikely to be reproduced in the e-environment. Examples include using RM for important records only, with the suggestion that an EDRMS could be the back end file store for line-of-business systems; using 'giant data buckets' accessed by search tools; not trying to manage emails as records, and either ignoring them completely if the risk of e-discovery problems is low, or automatically deleting emails after a specified period if the risk is judged as higher; not trying to manage content in social networking tools as records, or forbidding their use for work-related activities completely, or restricting their use to certain people for defined purposes. These are also solutions within the complex domain - though the changes themselves are straightforward, their adoption and implementation are complex issues.

Other solutions fall into the technological arena. People could use existing RM/IM functionality in line-of-business / office / mobile systems. However, such functionality is often rudimentary and to be more successful requires configuration of the system by the IT service to remove this burden from end-users. RM functionality could be embedded into line-of-

business / office / mobile systems, and vendors are taking this on board. However, such functionality will probably not provide the degree of RM required for archival records, and there is no generic, 'one size fits all' solution. System integration, i.e. bringing together systems so they function as one, has been tried; for example, integrating EDRMS with line-of-business and office systems. However, this is technically challenging and EDRMS integration with other systems is generally poor. Interoperability, i.e. systems working together by exchanging information and data, is likely to offer more advantages, and tools such as the Resource Description Framework (RDF), Web Ontology Language (OWL) and Extensible Markup Language (XML) will enable interoperability. Interoperability enables current systems to work together, but also provides for flexibility of response to changing organisational needs and new systems. The potential for interoperability is a design goal of MoReq2010 (DLM Forum Foundation, 2010, p.22). Enterprise solutions that combine the flexibility and use of new technologies, such as Web 2.0, with the greater control required for authentication, audit and compliance could be deployed. Automation of RM processes in systems in which information is created (e.g. office and line-of-business systems) and managed (e.g. EDRMS, line-of-business systems) is another solution. It should lighten the recordkeeping burden of staff but is technically challenging. Design of technological solutions resides in the complicated domain, but their selection, implementation and adoption are mostly affected by factors that lie in the complex domain (as discussed in Example 2).

Example 4: Planning a project or initiative

The final example explores how the Cynefin framework could be used to approach a major project or initiative, enabling a greater understanding of the nature of the phases/tasks involved to support more appropriate selection of approaches to tackling them. It is a 'thought experiment' informed by published literature rather than the AC^{+}erm data.

Van Beurden et al (2011) discuss the use of Cynefin in the context of health promotion which, like ERM, addresses a wide range of issues, from the simple to the complex. In addition to seeing Cynefin as a tool that can help make sense of how theory can inform practice and aid practitioners in choosing an appropriate approach, they suggest it can be used to plan or review a project. They provide an example which illustrates how a project team can "use the framework to make sense of how planning, project management and decision-making will vary for each component or stage of the overall project" (Van Beurden et al, 2011, p.78). "[D]ifferent aspects and/or stages may reflect different [Cynefin] domains requiring distinctive approaches" (Van Beurden et al, 2011, p.78). Using Cynefin to recognise in which domain the various stages and/or issues are situated enables the appropriate combination of solutions/approaches to be used to tackle them.

This use of Cynefin can be transferred to the ERM context. Here an example of a project or initiative is the development of a strategy and implementation plan for managing research data in a university, currently a significant challenge for universities in the UK and elsewhere. In the UK most of the seven Research Funding Councils, who are part of the Research Councils UK (RCUK) strategic partnership, have research data policies. These build on the OECD (Organisation for Economic Co-operation and Development) principles related to making data from publicly funded research openly available for re-use (OECD, 2007) and the RCUK's (aligned) common principles on data policy (Research Councils UK, 2011). The Funding Councils generally require researchers, at the time of a grant application, to provide details about how they will make their research data accessible (subject to any appropriate embargo period and/or regulatory requirements) and manage it through time (see for example ESRC, 2010, p.3; MRC, 2011; NERC, 2011). This is usually done by submitting a 'data management plan' with the grant application.

In Australia the *Australian Code for the Responsible Conduct of Research* (Australian Government, 2007) outlines expectations and good practice for conducting research for research institutions, including universities, and researchers which includes the management of research data. This covers policy requirements for "the ownership of research materials and data, their storage, their retention beyond the end of the project, and appropriate access to them by the research community" (Australian Government, 2007, Section 2 p.12). Similarly, in North America the National Science Foundation (2011, Chapter II.C.2.j) requires a data management plan to be included with all full research grant proposals.

In addition to funders' requirements for open access to data for secondary use, to support better return on investment and potentially greater impact of the research, other key drivers for managing research data include the broader potential for innovation and economic growth through use/re-use, as expounded in the UK Government's *'Innovation and Research Strategy for Growth'* report (Department for Business, Innovation and Skills, 2011) and by the Open Data Institute (http://theodi.org), regulatory compliance (e.g. Freedom of Information and Data Protection), a general societal drive for greater openness, transparency and accountability, and developments in digital technologies which have changed the way research is done, providing new opportunities for doing research and for data re-use.

For a university as a whole RDM, like ERM, is a wicked problem (Rittel and Webber, 1973), displaying all 10 characteristics of such a problem, viz.:

- *(i) lack of a definitive formulation of the problem, (vii) an essentially unique problem, (viii) a symptom of another problem, (ix) no criteria for determining the 'correct' explanation of the problem*

  Although RDM can be defined by the data management lifecycle i.e. managing data from creation/receipt to re-use and transformation (e.g. DCC, no date; UKDA, no date), it will be formulated differently according to a stakeholder's perspective. Researchers, librarians and research support staff have different needs because of their different contexts. For example, a researcher will formulate the problem as covering the whole lifecycle, a librarian will focus on the latter stages where data is ingested into a central repository, and research support staff may only be interested in a specific aspect of the data according to their support role (e.g. managing the data relating to the funding process or IT systems supporting data storage and security). Those conducting research are not a homogeneous stakeholder group and will have different views on the RDM problem. For some disciplines RDM will not be perceived as a problem. For example, a mathematician might consider they have no data; likewise an artist may view they have no data only the outputs of their practice (which might include a deliberately ephemeral installation). For other disciplines aspects of RDM can be particularly problematic. For example, a health researcher might believe that the data cannot be shared on epistemological grounds. Even a single type of organisation such as a university has its own history, culture, combination of academic disciplines, policies, procedures and systems, making their RDM problem a 'one off' at the granular level (McLeod, Childs and Hardiman, 2011, p.73-4), albeit one that shares a common macro-level scope with other universities.

- *(ii) no criteria for knowing when the/a solution has been found, (vi) no criteria for proving that all solutions have been identified and considered, (iii) solutions that are not true-or-false, but rather good/bad, better/worse, good enough/not good enough*

  There are many potential solutions. In fact a combination of different approaches, systems and processes will certainly be required to form a total RDM solution, e.g. different solutions for citing, linking, integrating and publishing research data or

capturing metadata (see for example JISC, 2009-11 and 2011-13). The sheer range of data types, processing and analysis required by researchers in different disciplines, working alone and/or in collaboration with others, makes for an almost infinite range of solutions. It is impossible to prove all possible solutions have been identified and it is impractical to consider many of them. They will be chosen because they are preferred, fit the resource constraints or for some other pragmatic reason. Different stakeholders will have their own views on how good, bad or satisfactory a solution (proposed or actual) is for managing the research data that is of concern to them which may differ according to time, space, project, funding requirements etc. Consider the deposit of data for long term storage and access. For some disciplines this is managed by national/international facilities. For example, raw observational data in astronomy is archived by the observatory where the observations were taken and made publicly available after an embargo period – the astronomer has to do nothing to make such data available; a social scientist might deposit all/most data in a specialist repository (e.g. the UK Data Archive, http://data-archive.ac.uk/) – the researcher is tasked only with preparing the data for deposit. For other disciplines where no such repository is available, long term data storage is on university servers or personal computing equipment with ad hoc public access arrangements.

- *(iv) no immediate or ultimate test of a solution, (v) every solution counts, and has significant consequences, (x) leaders/managers have no right to be wrong*

  A technical solution for an aspect of RDM (e.g. for encrypting data or a data repository for sharing data) can be tested for correct installation/operation and piloted to see if it fulfils the requirements brief. However, the full impact of its implementation will only become apparent through its use over time across the organisation, sometimes with unanticipated, possibly undesirable, consequences; e.g. burden on users to enter metadata, the capacity of the technical infrastructure, support and maintenance cost). The project team has no right to have chosen the wrong systems and services.

So how does a university tackle the RDM challenge? In 2011, the Engineering and Physical Sciences Research Council (EPSRC), a body that funds research in engineering and physical sciences in the UK, placed a requirement on all recipients of their funding to have developed a research data management (RDM) roadmap (i.e. a high level strategy) "to align their policies and processes with EPSRC's expectations by 1st May 2012, and to be fully compliant with these expectations by 1st May 2015" (EPSRC, 2011). This is not a trivial task. In the UK, major programmes and organisations are supporting universities to address specific aspects of RDM; e.g. JISC's two Managing Research Data Programmes (JISC, 2009-11 and 2011-13); and the Digital Curation Centre's guidance, training, tools and services, consultancy and advice covering the full development cycle, from business case to implementation (DCC, http://www.dcc.ac.uk/).

Given the nature of the problem and the range of stakeholders the Cynefin framework could be used to plan an RDM project or initiative at the strategic and/or tactical level, viewing it in the same way Van Beurden et al (2011) did for health promotion.

As the RDM strategy has to accommodate the various different stakeholders involved, including senior management and all research disciplines, the first stage is to make-sense of the issue and to understand the different stakeholder perspectives. The Cynefin 'four points' workshop method (Snowden, 2010, Part 5) could be used with a representative sample of stakeholders. At the strategic level this might involve senior staff in information management (e.g. a records manager, institutional repository manager, information governance manager), IT services and research support, the senior people responsible for research (e.g. Pro Vice Chancellor/Associate Deans/Directors of Research), and representatives of the research

community. They would capture their views, concerns and requirements for RDM (creating the 'sense-making narratives') and select the four that represent the "extreme states" (Snowden, 2010, Part 5 p.3) and therefore the domains of the framework (i.e. simple, complicated, complex, chaos). Together they would then position the remaining 'narratives', some lying firmly in one particular domain, others on domain boundaries and a few in the central area ('disorder') when consensus cannot be reached about which domain to best place them. The latter would then, ideally, be relocated in one of the four domains, either through discussion or by de-composing the 'narrative' into more specific aspects which can be placed. Van Beurden et al (2011, p.28) provide an example the latter. The 'four points' workshop results in a populated Cynefin framework specific to the individual university's RDM context. The benefit of using this approach is that the different stakeholders can begin to more fully understand "the degree of complexity inherent in issues, the diversity of viewpoints and the ways in which they might work together to find solutions" (Cognitive Edge, 2007, cited in Van Beurden et al, 2011, p.28). The 'post-process' would then utilise this contextualised Cynefin framework for RDM for planning or more detailed discussion. At the strategic level, with the participants identified above, this might result in a strategic roadmap (i.e. a high-level strategy), or it might identify a series of tactical projects to undertake, or both.

Pursuing this example, imagine that one of the issues to emerge is the need to understand the current status of RDM in the university, its 'RDM readiness', before planning how to improve it to meet external and internal drivers. A decision is taken to conduct an assessment of current RDM practice and existing infrastructure to support RDM and a working group is set up to undertake this task. Adopting Van Beurden et al's (2011) idea, the Cynefin framework can be used to understand the different elements or stages of this project and therefore how best to approach it for the best outcome. Figure 3 shows that the project begins with a high level survey of current RDM practice amongst research staff (simple domain). The next stage is a more detailed assessment of how research data is being managed in selected research groups or departments and of existing RDM infrastructure. The latter resides in the complicated domain because it requires expertise to be completed successfully and there is more than one way to approach it (i.e. good practice). Interviews, focus groups and/or online tools such as the Data Asset Framework (DCC, www.dcc.ac.uk/resources/repository-audit-and-assessment/data-asset-framework) could be used to gather data, which could be analysed and presented in different ways (e.g. rich pictures, gap analysis). The outcome of the assessment is reported back to the working group. For the university RDM is an emergent issue and therefore might be seen as residing in the complex domain; a solution(s) may exist but it is not known what that is. After discussing the assessment findings, the working group decides to initiate three 'infrastructure improvement initiatives' one for each of the three essential infrastructure elements needed for RDM, i.e. human, procedures and technology (McLeod and Childs, 2012). Pursuing this example, three teams, each comprising a relevant mix of stakeholders, might use the Cynefin framework to plan and manage the implementation of each of the infrastructure improvement initiative projects.

Human infrastructure supports engagement in, capacity and capability for RDM and will therefore involve, for example, advocacy, awareness raising, training and mentoring. As Example 1 illustrates these issues reside in different domains, particularly simple and complex, and require different solutions/approaches. Procedural infrastructure enables researchers to 'do RDM themselves and with confidence' and comprises policy, templates, exemplars, guidance etc. It sits in the simple and complicated domain since there is some 'best practice' (e.g. a right answer for the retention of certain data because of legislation) but also much 'good practice (e.g. different approaches to preserving digital data).

Technology infrastructure, which enables the implementation of best/good practice RDM, includes platforms/tools for data creation; secure data storage, access and retrieval;

preservation and deletion. An initiative to improve the technology infrastructure may begin in the complicated domain as there are a number of potential solutions, but elements of it also reside in the simple domain (e.g. providing a backup service, implementing access rights). There is a risk this issue, or some aspects of it, might move across the boundary into the chaos domain leading to the breakdown of RDM. As in Example 3, with the breakdown of recordkeeping, technological developments and the innately innovative nature of researchers may contribute to this. Open source software, creative developer communities and the desire to collaborate make it very easy to utilise non-standard software on cloud-based platforms to create and store research data. This is illustrative of the weak connections between central IT services and research staff, characteristic of both the complex and chaos domains. Being aware of this risk, and perhaps accepting that it is inevitable, even desirable, in such an innovative environment, enables it to be managed appropriately, e.g. by the clarification of roles and responsibilities, use of risk management strategies and governance.

Insert Fig. 3. Using the Cynefin framework to understand and plan the implementation of a research data management initiative

Stepping back and considering the RDM challenge, including data sharing and open access, across the whole of the higher education sector in the UK through the lens of Cynefin, does it reside in the domain of chaos? Possibly. If we consider that it is then we can make sense of how national bodies are tackling the problem. By developing a set of principles on data policy (Research Councils UK, 2011) RCUK has taken a decisive, directive approach (imposition) to force a move from chaos to the simple domain. Its Council members are implementing this by requiring, for example, data management plans to be part of research grant applications, and the EPSRC (2011) has made the strongest imposition through its requirement for universities to have developed and implemented a RDM roadmap (strategy and action plan) by 2015. This approach is one of control: 'do what we say and the problem will be addressed'. Contrast this with JISC's approach. The two JISC RDM programmes (JISC, 2009-11 and 2011-13) have invested more than £6.5million to fund many projects on a series of themes identified by JISC as important for tackling the challenge. The projects had an aim (e.g. citing and linking data, training and building capacity) but the method of achieving this was not prescriptive. Innovation and ideas were encouraged, even if some were exploring competing solutions (Snowdon, 2005, p.51). Critically JISC proactively facilitated sharing of ideas and experiences between project teams and required all outcomes to be openly reported and all outputs to be freely available. The aim was to cascade the learning and ideas for others to adopt or adapt. This approach is swarming (Kurtz and Snowden, 2003) and the project outputs/outcomes are the swarming points. JISC's explicit approach to sharing and cascading the learning has supported the replication of the successful practice to move RDM from chaos to the complex domain and then complicated domain as good practice is developed. As good practice exemplars and tools from outside become embedded in a university they may become best practice for a particular university (incremental improvement) moving from the complicated to the simple domain.

There is potential for other dynamics to operate (see Figure 2). In individual universities there is space to develop new approaches through exploration of complicated issues. The movement is from the knowable to the complex and therefore has to be done selectively, perhaps on a particularly important issue. Kurtz and Snowden (2003) say that trust is critical, allowing for example an informal group of people to explore the issue with little central control and learn – a 'blue sky' team. The JISC implementation projects are exemplars of the 'exploration/just-in-time transfer' dynamic. Here experts explore (complex domain) and if their ideas work they are exploited and become good practice. Much of the DCC work in the JISC programmes supports this just-in-time transfer of good and best practice (i.e. complicated and simple) they want universities to adopt.

RDM is an emergent issue, resulting from a political and social groundswell, located in the complex domain. It is a wicked problem and therefore deciding on a solution defines the problem. This example is a 'theoretical' exploration of using Cynefin to tackle the problem, highlighting the framework's potential for working with the range of stakeholders to help share understanding, and to select and implement appropriate solutions. The exploration of dynamics illustrates that an RDM initiative involves dealing with issues from a number of domains, both simultaneously and in turn but not in a 'logical' way, i.e. not going round the circle but moving more freely.

Discussion

The preceding four examples have explored how the Cynefin framework can be used to tackle specific aspects of the ERM challenge either using the empirical data from the AC$^+$erm project or using a thought experiment with a different RM problem (research data management). Some aspects of ERM are simple or complicated and can be addressed using best or good practice; addressing them is not necessarily easy but it can be done. Other aspects are complex or chaotic; solutions are open to dispute and stakeholder preference, and are likely to be temporary. The ERM framework developed from the AC$^+$erm research project using Cynefin helps identify the domain nature of the issues.

Those issues which fall in the complex and chaos domains, i.e. the wicked problem aspects of ERM, are by definition not easy to address. It may not be possible to solve them, or at least not to find an enduring solution. Pidd (2009, p.46) uses the term 'mess', as defined by Ackoff (1974, 1979), to mean the same as a wicked problem. A mess, he says, comprises many issues which are interrelated and stresses the importance of the interrelationships: "to work with messes requires the analyst to be able to see the links as well as the separate issues. That is, the links may be as important as the separate parts of the mess, and these may need just as much attention" (Pidd, 2009, p.46). He refers to Langley et al (1995, p.270) and their concept of 'issue streams' i.e. interrelated sets of issues which flow on over time and are linked in different ways. "Problems are [social] constructs that emerge from ongoing issue streams and to which attention is paid" (Pidd, 2009 p. 50). The crucial point about issues according to these authors is that they "persist in some form or another for considerable time. They do not necessarily die even when key decisions are made" (Langley et al, 1995, p. 270) and "any solved problem remains solved for only a period of time" (Pidd, 2009 p. 48). Applying this thinking to the complex and chaotic aspects of ERM suggests trying something that seems appropriate for the context at the time, to tackle the issue or issue stream, based on an understanding of its domain nature and in the full knowledge that the issue will return. The ERM challenge will remain and the returning issues and issue streams will evolve and change. We should therefore avoid a mindset that searches for a complete and enduring solution, however large or small, to this wicked problem. All the research and practice to date has not 'solved' the problem and that is not the point. Instead, we should be comfortable with the idea that probes to tackle complex issues and swarming points to tackle complex ones (Snowden, 2010) may or may not always be successful. Some solutions will be successful in addressing part(s) of the problem in a particular context, from a particular perspective and at a particular point in time.

A flexible, agile approach, what Brown and Eisenhardt (1998, p. 9) term a 'semi-coherent strategic direction', is needed. Some of the ERM challenge needs to be tackled at the top level of an organisation, some at the level of the records manager in the organisation. The records manager's approach can be tactical or strategic depending on the particular issue(s) being addressed. The ERM framework developed from the AC$^+$erm research and/or the Cynefin approach can be used in both cases. They can be used to bring different stakeholders together or just the RM team(s). Cynefin can be used to understand the situation, identify solutions and share different perspectives. It can be used to plan and

manage specific projects. It is a flexible technique which can be used at different levels, for different purposes (in the ERM context), in different ways and with different people to understand what can and cannot be tackled at that level. Cynefin offers a way of thinking, of making sense of the problem or situation, leading to making appropriate decisions and taking appropriate action.

Snowden (2010, Part5), in discussing the 'post-process' of the four points method of using Cynefin, says that the model or "populated framework" can be used (i.e. exploited) in the organisation in different ways; e.g. in "training programmes so that it becomes part of the common discourse of the organisations"; "to test for cultural affinity, show different silos how their different perception of the domains is creating conflict or misunderstanding". He refers to this as having "the advantages of a categorisation model, but if the model starts to stretch we can always re-set using the emergent process, moving from exploitation to exploration then back to exploitation again" (Snowden, 2010, Part5, p.4). Similarly the populated ERM framework developed from the AC^{+}erm data (Appendix Table AI) can be exploited to take a strategic, holistic approach in any context. If it does not fit well, then Cynefin can be used to explore the ERM challenge or part of it from scratch, and the resultant model particular to that context (the populated framework) can be used. This is the 'exploit > explore > exploit' value of Cynefin.

These examples of using Cynefin suggest it is a promising technique for tackling the ERM challenge. Unlike simple analytic techniques such as a SWOT (strengths, weaknesses, opportunities, threats) analysis, Cynefin takes the analysis further to identify the appropriate decision model and types of actions and techniques to adopt. Kurtz and Snowden (2003, p. 468) contrast the Cynefin framework with commonly used categorisation frameworks such as SWOT: "In a categorization framework, four quadrants are often presented in a two-by-two matrix … Typically, it is clear (though often unstated) that the most desirable situation is to be found in the upper right-hand quadrant, so the real value of such a framework is to figure out how to get to the upper right. In contrast, none of the domains we will describe here is more desirable than any other; there are no implied value axes." Additionally, unlike other techniques familiar to and commonly used by records managers, such as functional analysis and business process analysis, Cynefin is not limited to one aspect such as business functions or processes. However, Cynefin does require effort if it is to be used for more than simply categorising the problem. It either requires the expertise of a facilitator who has used it before and understands its underlying philosophy or needs significant time investment to understand it and use it appropriately. It requires the 'buy-in' of all those participating in its use.

The examples presented here are limited; they represent the use of Cynefin with one data set and one thought experiment (hypothetical scenario). Therefore further application and empirical testing are required. To this end, we (McLeod and Childs, 2013a,b) have compared the Cynefin framework with other problem structuring techniques such as soft systems methodology and contrasted our approach to using Cynefin with other authors' use in the information management field.

Conclusion

"Truly adept leaders know not only how to identify the context they're working in but also how to change their behaviour to match" (Snowden and Boone, 2007, p.74). If we are to accelerate the pace of positive change in ERM, the overall aim of the AC^{+}erm project, then surely this is critical. The Cynefin framework provides records management leaders with a lens through which to view the challenge. The examples discussed here illustrate the potential value and power of the Cynefin framework as both a practical and conceptual tool in the context of managing electronic records. It can be used at both the strategic and tactical level. It can be used to inform practice by helping practitioners choose the most

appropriate approach dependent on the level of complexity of the issue they are addressing, whether that is for a specific issue, a project or initiative, for planning or for exploratory, sense-making purposes. There seems no reason why it could not be used for other information and records management challenges. However, what is required is more experimentation with, and practical use, of the Cynefin framework, empirical testing against other methods, and sharing of the results.

Insert
Notes:
[1] A copy of the complete ERM framework and the complete collection of solutions is available on the AC+erm research project website http://www.northumbria.ac.uk/acerm

Note to production team: each of the appropriate tables and appendix in the Fig/Tables file have the Note number ([1]) included

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Insert Appendix Table AI: The populated Cynefin framework for the ERM people issues Note to production team – please ensure this table is placed at the very end of the article